

**REMARKS**

This response is being filed after the shortened statutory period for filing a response to the outstanding Office Action. Therefore, a petition and a fee for an extension are enclosed herewith.

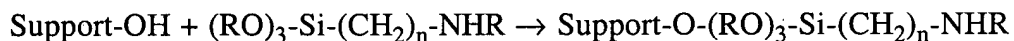
In item 2 on page 2 of the outstanding Office Action, the Examiner rejects Claims 21, 25, and 27-37 for allegedly being indefinite under 37 C.F.R. § 112, second paragraph. According to the Examiner, Claims 21, 25, and 27-37 do not consistently use the term "composition" or "system." The Applicants respectfully traverse this rejection because Claims 21, 25, and 27-37 each claim a heterogeneous catalytic system, rather than a heterogeneous catalytic composition. Thus, Claims 21, 25, and 27-37 consistently use the term "system" rather than the term "composition"; and, consequently, Claims 21, 25, and 27-37 are not indefinite under 37 C.F.R. § 112, second paragraph.

In item 5 on page 3 of the outstanding Office Action, the Examiner provisionally rejects Claims 1-7, 10-18, 21, 23-25, and 27-37 under the judicially created doctrine of obviousness-type double-patenting. The provisional obviousness-type double-patenting rejection in the outstanding Office Action is respectfully traversed; and the Applicants will decide at a future time whether or not to file a terminal disclaimer to overcome this rejection.

In item 7 of the outstanding Office Action, the Examiner rejects Claims 1-7, 10-18, 21, 23-25, and 27-37 for allegedly being anticipated by or obvious over European Patent Document No. 0 802 203 (hereinafter referred to as the "Hidalgo-Llinas document"). The Applicants respectfully traverse this rejection for the reasons that are set forth below; and, consequently, this rejection should be withdrawn.

The Hidalgo-Llinas document discloses a process for preparing a catalytic system comprising the following three consecutive steps, which are described below:

Step 1: Functionalizing an inorganic support containing surface hydroxy groups by reaction with a bifunctional compound of Formula I (see lines 22-23 on page 8 of the Hidalgo-Llinas document). Formula I (see lines 1-10 on page 4 of the Hidalgo-Llinas document) contains two types of reactive groups: (1) Si-(OR) groups, which react with the hydroxy groups on the surface of the inorganic support; and (2) an additional heteroatom-containing functional group (e.g., an optionally substituted amine group or a thiol group). The chemistry involved in Step 1 may be summarized as follows:



As indicated in the preceding reaction scheme, hydroxy groups on the support surface react with the organic reagent and a siloxy ether linkage is formed. The resulting treated support containing an organic molecule attached through a siloxiether bond is known as a "functionalized support," which is represented by Formula II (see lines 27-43 on page 8 of the Hidalgo-Llinas document).

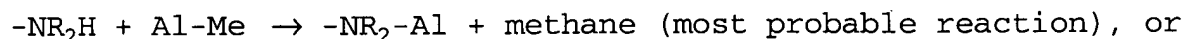
Step 2: Reacting an organoaluminum compound (e.g., methylaluminoxane (MAO)) with the functionalized support from Step 1 (see lines 47-48 on page 8 of the Hidalgo-Llinas document) to yield an organoaluminum-treated

functionalized support.

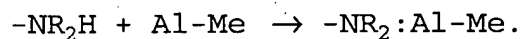
Step 3: Adding a nonfunctionalized metallocene of Formula III (see lines 25-38 on page 4 of the Hidalgo-Llinas document) to the organoaluminum-treated functionalized support from Step 2 (see lines 48-50 on page 8 of the Hidalgo-Llinas document).

In order to illustrate more clearly the composition of the final catalyst that is produced by the Hidalgo-Llinas process, we are enclosing herewith a document entitled "Scheme 1," which shows Steps 1, 2, and 3 and the possible chemical species that is formed. (Scheme 1 is a simplified summary showing some of the most probably generated chemical species on the solid and is rationally based on the best current scientific knowledge. However, the Applicants do not wish to be bound by any particular theory.)

MAO, which is an oligomer mixture of several chemically different species (linear and cyclic types of different molecular size), could probably react either with an  $\text{-NR}_2\text{H}$  group generating amido-type bonds, such as:



it may simply form a coordinative bond of the basic-acid type:



In Scheme 1, the metallocene shown is  $\text{Cp}_2\text{ZrCl}_2$ ; and it is believed that this metallocene reacts first with methyl groups from the MAO to be alkylated and the final cationic form is generated (i.e.,

the active species). (For the sake of simplicity, not all of the reactions are shown in Scheme 1. Only the presumably active catalytic species are shown.)

In summary, in the Hidalgo-Llinas document, the metallocene is bonded through a cation-anion interaction with an MAO molecule, which itself is bonded to the support through bonds with one of the ends (optional amino groups) of a "bifunctional" organic molecule, which in turn is bonded through the other end to surface silica. Silica reacts with this "bifunctional" organic reagent containing silica reacting groups (of the Si(-OR) type) and optionally amino or thiol groups to render a functionalized silica prior to the contact with MAO.

The catalytic composition/system as claimed in Claims 1 and 21 differs from the catalytic system that is described in the Hidalgo-Llinas document because the claimed catalytic composition/system is made by a process that differs from the Hidalgo-Llinas process.

In Claims 1 and 21, a nonfunctionalized support is first reacted with an alumoxane (e.g., MAO), whereas in the Hidalgo-Llinas process the inorganic support is first functionalized by reaction with a bifunctional compound of Formula I (see lines 22-23 on page 8 of the Hidalgo-Llinas document) before the resulting functionalized support is reacted with an organoaluminum compound (e.g., MAO). Then, in Claims 1 and 21, after the nonfunctionalized support is reacted with an alumoxane (e.g., MAO), the resulting support is reacted with a metallocene compound as defined by formula I, II, or III. By contrast, in the Hidalgo-Llinas process, after the functionalized support is reacted with an organoaluminum compound (e.g., MAO), the resulting support is reacted with a metallocene of Formula III (see lines 25-38 on page 4 of the Hidalgo-Llinas document); and none of the examples in the

Hidalgo-Llinas document disclose or suggest using a metallocene compound with an  $\text{OSiR}^{\text{II}}_3$  functional group.

In order to illustrate more clearly the catalytic composition/system that is claimed by Claims 1 and 21, we are enclosing herewith a document entitled "Scheme 2," which shows Steps 1 and 2 and the possible catalytic compositions/systems that are formed. (Scheme 2 is a simplified summary showing some of the most probably generated catalytic compositions/systems and is rationally based on the best current scientific knowledge. However, the Applicants do not wish to be bound by any particular theory.)

In Claims 1 and 21, Si-O-Si siloxane groups are believed to remain after the inorganic support is reacted with the alumoxane (e.g., MAO), which reacts preferably and firstly with OH groups; and those remaining Si-O-Si siloxane groups are highly reactive with the  $\text{OSiR}^{\text{II}}_3$  functional group of the claimed metallocene compound.

The reactivity of the Si-O-Si siloxane groups has been reported by Dubois L.H. & Zegarsky B.R. (J. Am. Chem. Soc. 115, 1191-1193 (1993)) and by Blumel J. (J. Am. Chem. Soc. 117(7), 2112-2113 (1995)) and can be depicted as follows:

**[INSERT FORMULA FROM TOP PAGE 5]**

The reaction between the Si-O-Si siloxane groups and the  $\text{OSiR}^{\text{II}}_3$  functional group of the claimed metallocene compound allows for the apparent simultaneous interaction (with both silica and with

MAO) of the metallocene with the inorganic support; and, this simultaneous interaction produces a different and stronger fixation of the metallocene compound to the support than is suggested by the Hidalgo-Llinas document and the other cited art. The simultaneous interaction, which is not taught or suggested by the Hidalgo-Llinas document and the other cited art, is advantageous because it produces catalytic compositions/systems that have higher activities and results in lower formation of polymer fine particles, which are features that are beneficial to the industrial production of polymers and copolymers.

In item 9 of the outstanding Office Action, the Examiner rejects Claims 1-7, 10-18, 21, 23-25, and 27-37 for allegedly being obvious over European Patent Document No. 0 372 414 (hereinafter referred to as the "Antberg EPO document") and European Patent Document No. 0 206 794 (hereinafter referred to as the "Welborn document"). The Applicants respectfully traverse this rejection for the reasons that are set forth below; and, consequently, this rejection should be withdrawn.

(The Antberg EPO document is in German; and the undersigned attorney does not speak German. Therefore, rather than discussing the Antberg EPO document, the following discussion refers to Antberg et al.'s U.S. Patent No. 5,071,808 (hereinafter referred to as the "Antberg U.S. patent"), which is believed to be an English-language equivalent of the Antberg EPO document because the Antberg U.S. patent and the Antberg EPO document both claim priority to German Patent Application No. 3840772 (filed December 3, 1988).)

The catalytic composition/system that is claimed in Claims 1 and 21 has improved activity and, when used to (co)polymerize olefins, produces improved polymer morphology (i.e., less fine polymer particle formation). The claimed catalytic composition/system

achieves these results because the claimed metallocene compound with the  $\text{OSiR}^{\text{II}}_3$  functional group produces a superior, stronger, and different fixation to the support than what is taught or suggested by the cited art due to simultaneous interaction (bonding), which is described below:

- a. the known anion-cation interaction based on methylalumoxane (anion) and the claimed cationic metallocene compound; and
- b. additional bonding to the silica support through the reaction of the  $\text{OSiR}^{\text{II}}_3$  functional group of the claimed metallocene compound with remaining siloxane bonds after the silica has reacted with MAO.

Both the Antberg U.S. patent and the Welborn document fail to teach or suggest the catalytic composition/system that is claimed in Claims 1 and 21.

For example, the Antberg U.S. patent discloses a "heterogeneous metallocene component," which does not contain MAO and which is obtained by reacting a polymer:polymethylhydrogensiloxane (not silica) with a metallocene containing a side chain bonded to cyclopentadienyl ligands with a double bond. In order to be used in polymerization, MAO must be added to the reactor to activate the heterogeneous metallocene component. Because the Antberg U.S. patent teaches that the metallocene must be attached to the support before it is exposed to the MAO, the Antberg U.S. patent does not teach or suggest the claimed catalytic composition/system, wherein a nonfunctionalized support is first reacted with MAO before the resulting support is reacted with the claimed metallocene compound with the  $\text{OSiR}^{\text{II}}_3$  functional group.

The Welborn document discloses a supported catalyst that is prepared by reacting a metallocene with an alumoxane in the presence of a support. However, the metallocenes that are disclosed or suggested by the Welborn document do not include the  $\text{OSiR}^{\text{II}}_3$  functional group as claimed in Claims 1 and 21; and, thus, additional bonding of the metallocene to the silica through ligands, which is expected in the claimed catalytic composition/system, is not possible in Welborn's supported catalyst.

A key aspect of the claimed catalytic composition/system is the simultaneous interaction (in the same solid composition) of the claimed metallocene compound with the alumoxane and with the silica (making use of the reactivity of the Si-O-Si siloxane bonds with ligands containing the claimed  $\text{OSiR}^{\text{II}}_3$  functional groups). This simultaneous interaction is not taught or suggested by the Welborn document or the Antberg U.S. patent.

In item 8 of the outstanding Office Action, the Examiner rejects Claims 1-7, 10-18, 21, 23-25, and 27-37 for allegedly being anticipated by or obvious over Canich et al.'s WIPO International Publication No. WO 92/05203 (hereinafter referred to as the "Canich document"). The Applicants respectfully traverse this rejection for the reasons that are set forth below; and, consequently, this rejection should be withdrawn.

As mentioned above, in Claims 1 and 21, a nonfunctionalized support is first reacted with an alumoxane (e.g., MAO) and then the resulting support is reacted with the claimed metallocene compound, which is defined by formula I, II, or III and which has an  $\text{OSiR}^{\text{II}}_3$  functional group. There is a simultaneous interaction (in the same solid composition) of the claimed metallocene

compound with the alumoxane and with the silica (making use of the reactivity of the Si-O-Si siloxane bonds with ligands containing the claimed  $\text{OSiR}^{\text{II}}_3$  functional groups). This simultaneous interaction is not taught or suggested by the Canich document because the Canich document does not teach or suggest using the claimed metallocene compound with an  $\text{OSiR}^{\text{II}}_3$  functional group. Consequently, the claimed invention is novel and nonobvious over the Canich document.

As mentioned above, the claimed catalytic composition/system has improved productivity and results in improved polymer morphology (i.e., lower small polymer particle formation). These improvements are described in great detail in Appendix I in the enclosed executed "Declaration Under 37 C.F.R. § 1.132" (hereinafter referred to as the "Declaration"). Furthermore, Appendix I in the Declaration explains why the claimed invention is unexpectedly superior to what is disclosed or suggested by the cited art. And because the improvements that are described in Appendix I in the Declaration are not taught or suggested by the prior art, Claims 1 and 21 are further nonobvious over the prior art.

The remaining claims (i.e., Claims 2-7, withdrawn Claim 8, Claims 10-18, withdrawn Claim 20, Claims 23-25 and 27-37, and withdrawn Claims 38 and 39) are nonobvious over the prior art because these remaining claims are each directly or indirectly dependent on a nonobvious base claim (Claim 1 or 21). In addition, these remaining dependent claims are further nonobvious over the prior art because the prior art does not teach or suggest the particular features that are claimed in these dependent claims.

If Claims 1 and 21 are ultimately found to be allowable, then the Examiner is respectfully requested to consider nonelected Claims

8, 20, 38, and 39 on the merits because these nonelected claims are each dependent on an allowable elected base claim (Claim 1 or 21).

In view of the foregoing, favorable reconsideration of the amended application is respectfully requested. It is submitted that the claims of record are in condition for allowance. Allowance of the claims at an early date is solicited.

The Applicants reserve the right to seek protection for any unclaimed subject matter either subsequently in the prosecution of the present case or in a divisional or continuation application.

The Commissioner is authorized to charge any additional fees which may be required or credit overpayment to Deposit Account No. 12-0415. In particular, if this Amendment is not timely filed, then the Commissioner is authorized to treat this Amendment as including a petition to extend the time period pursuant to 37 C.F.R § 1.136(a) requesting an extension of time of the number of months necessary to make this Amendment timely filed; and the

petition fee due in connection therewith may be charged to deposit account No. 12-0415.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first-class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on

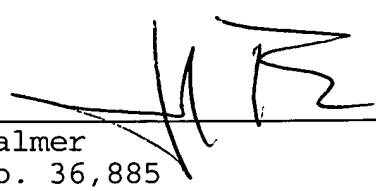
February 28, 2005  
(Date of Deposit)

JOHN PALMER  
(Name of Applicant, Assignee  
or Registered Representative)

(Signature)

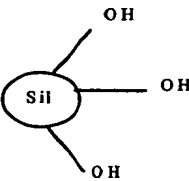
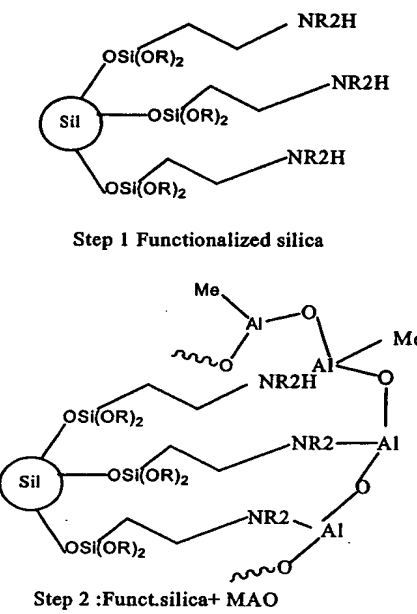
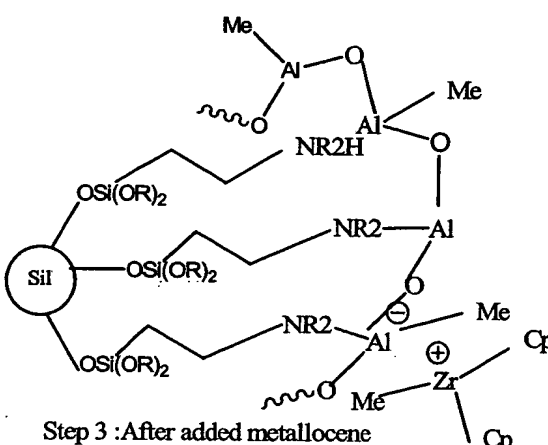
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Respectfully submitted,

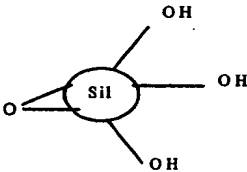
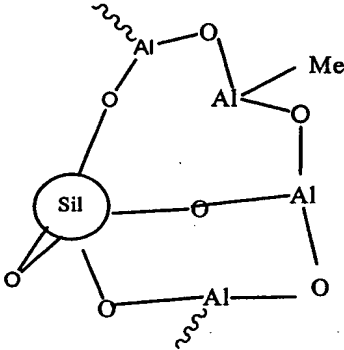
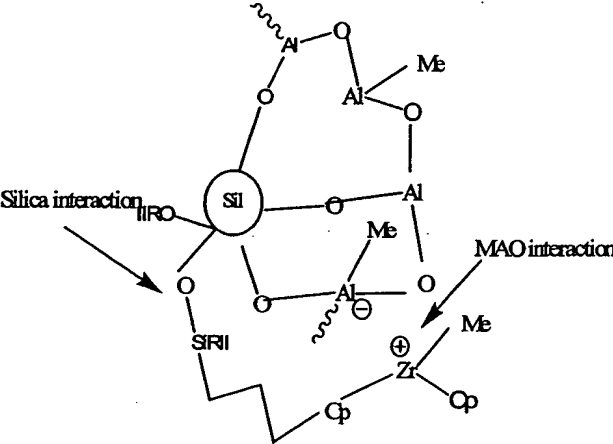
  
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Enclosures: A document entitled "Scheme 1" (1 page)  
A document entitled "Scheme 2" (1 page)  
A document entitled "Declaration Under 37 C.F.R. § 1.132" (7 pages)

**Scheme 1**  
**Catalytic composition disclosed by Hidalgo Llinas (EP 0 802 203)**

Solid precursor	Sequence of reactions of the support prior to contact it with the metallocene	Final form of catalyst
	 <p>Step 1 Functionalized silica</p> <p>Step 2 :Funct.silica+ MAO</p>	 <p>Step 3 :After added metallocene</p>
<p>Silica containing hydroxy groups. Siloxane bonds not shown for clarity</p>	<p>Functionalized silica with optional NR<sub>2</sub>H groups is reacted in a second step with MAO .</p>	<p>Final catalytic composition:  Initial metallocene (Cp)<sub>2</sub>ZrCl<sub>2</sub> is alkylated "<i>in situ</i>" (not shown) and the active species is bonded via an anion-cation interaction with MAO itself attached through a "bifunctional" organic molecule containing at one end silica reacting groups and at the other end optionally amino groups.  [Cp = Cyclopentadienyl group]</p>

**Scheme 2**  
**Catalytic composition disclosed by instant patent application (US 09/299,539)**

Solid precursor	Sequence of reactions of the support prior to contact it with the metallocene	Final form of catalyst
	 <p>Step 1 :Silica reacted with MAO</p>	<p align="center">Simultaneous metallocene interaction</p>  <p>Step 2 :Functionalized metallocene reacts with both silica surface siloxi bonds and MAO prereacted with silica.</p>
<p>Silica containing hydroxy groups and siloxane groups</p>	<p>Silica containing OH groups is made directly to react in one step with MAO. After reaction, it is expected that all OH groups react with MAO but most of the siloxane groups remain</p>	<p>Final catalytic composition:</p> <p>Initial metallocene  <math>[\text{Cp}-(\text{CH}_2)_n-\text{OSiR}^{\text{II}}_3](\text{Cp})\text{ZrCl}_2]</math>  is alkylated "<i>in situ</i>" and the active species is bonded to the support via <b>two</b> main types of bonds (<b>simultaneous interaction</b>):</p> <ol style="list-style-type: none"> <li>a) an anion-cation interaction with MAO itself attached directly to silica; and</li> <li>b) a direct bond through the functional group attached to one of the Cp groups of the metallocene.</li> </ol> <p>Alternatively: A coordinative bond of the type <math>\text{R}^{\text{II}}_3\text{SiO}:\text{Al}</math> present in MAO could be formed instead for <i>some</i> metallocene molecules which eventually could not react with silica through the functional group as in the case above. In this case, also, an additional and simultaneous interaction occurs [which is not possible with non functionalized metallocenes (Welborn type metallocenes)]</p>